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NEWSLETTER

of the

Hawaiian Botanical Society

Volume II
Number 8
November 1963

SMITHSONIAN
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P T E R I D O L O G Y I N H A W A I I

Warren H. Wagner, Jr.[1]

"No thank you; I hate ferns," said Miss Clara 85 years ago when the collecting and study of ferns was the vogue in Hawaii. According to the traveler Chaney (1879) who was astounded at the oneness of interest shown by the denizens of the islands, "The moral courage it took to utter such a sentiment in Hawaii can only be known by one who has been there." In those days, the collection and study of Hawaiian pteridophytes was not only the fashion, but we learned much about these plants as a result.

What is the situation today? The American Fern Society membership for 1962 numbered just short of 900, including members outside of the United States in 28 countries -- but not a single member from the entire state of Hawaii! In fact, the only American Fern Journals that arrive in the islands are institutional subscriptions for the Bernice P. Bishop Museum and the Experiment Station of the Hawaiian Sugar Planters' Association. Surely this represents a remarkably low level of interest for an area which has perhaps the most unusual flora of lower vascular plants in the world, and an area in which ferns, more than in any other place in the United States, are a conspicuous and beautiful segment of the local landscape.

For all of continental United States including Alaska and Florida, I estimate a total of 360 species of pteriodphytes. The average state has roughly 65 species, and only Florida has twice this number. Hawaii, on the contrary, greatly exceeds any other state. There are probably more than 180 species in the islands, and the figures by themselves are misleading. In sheer abundance and floristic importance the pteriodophytes provide a substantial portion of the local vegetation. Hawaii also includes some of the most interesting groups of pteriodophytes on earth, of which perhaps as many as two-thirds will prove to be endemic (cf. Fosberg, 1948) and found nowhere else in the world.

I should like to briefly describe some of the current and recent work on Hawaiian pteriodophytes and some of the outstanding problems. I have the feeling that many of the local botanists hesitate to study these plants seriously because of certain difficulties that they present. For one thing, the variability of the species in a number of genera is very extensive. This is due in part to the extremes of environmental conditions that prevail in the mountains of Hawaii, but also in part to genetic changes. In field work in 1961, I was surprised to find that certain seemingly normal populations when examined cytologically showed highly irregular chromosomal situations so that cross-

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1/ Professor of Botany and Curator of Pteriodophytes, University of Michigan, Ann Arbor.
Manuscript received September 5, 1963.

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ing between related species is probably occurring. The fact that a particular "kind" of fern forms large, healthy populations is no definite way of knowing whether it may not be a sterile hybrid. Ferns are notorious for their ability to form extensive clones by vegetative propagation of rhizomes, even if they are sterile crosses.

Another deterrent to the study of the Hawaiian pteridophytes is the typification of taxonomic names. This is a particularly serious problem, because so many explorers visited the islands in the early days (e.g., David Nelson, Menzies, Chamisso, Freycinet, Gaudichaud, Brackenridge), and so many different writers dealt with one or another group of the local ferns. Many of the type specimens -- the majority, in fact -- are scattered in European herbaria, so that we have not only the problem of working out what are the distinct natural populations and their variations, but we still have to determine for a number of species which of several potential names is correct.

Neither of these problems is unsurmountable, of course. I have been working for the past decade and a half on a key and check-list for the pteriodophytes of Hawaii, with the help and encouragement of a number of local botanists, including especially Harold St. John, E. H. Bryan, Jr., and Charles H. Lamoureux, but my work is by no means complete. Nevertheless, definite progress has been made, and there has been some fruitful activity (as shown by the list of references attached to this article). I should point out that we are now in a position, thanks to a number of recent developments in biosystematics, to achieve more objective understanding of species problems than was heretofore available. Such study in Hawaiian pteriodophytes is still in the beginning stages. The same can be said for the rest of the Hawaiian flora, for that matter.

I do not agree with the propaganda that the Hawaiian flora will soon disappear and that "all is lost." Currently, all botanists are concerned with the rapid destruction of still unexplored tropical areas (for example, in tropical American and Africa). In Hawaii, on the contrary, I have yet to be convinced that the same situation prevails. In terms of the amount of general collecting that has been carried out, Hawaii probably equals or exceeds the majority of the other states of the U.S.A.

Carefully set aside water reserves and natural area preserves in the Hawaiian Islands will, I believe, maintain for future generations the wonderful native vegetation of the islands. I think that the time is now nigh for careful collecting by specialists, rather than crude gathering or "hay-baling" of all plants in sight. The herbaria are now overloaded with specimens of common Hawaiian species. It takes the specialists to find the unusual and significant collections of the rarer species.

The time is also ripe for careful biosystematic studies of the native plants of Hawaii. Many groups offer fascinating problems, and there are some excellent situations calling for research in the pteriodophytes, examples of which I should like to mention here. First, however, I should note some of the substantial work that has appeared in the past fifteen years. For some time Professor Vladimir Krajina has been studying the tree-ferns ("Hap'u"), Cibotium, and in 1962 he presented an outstanding report on his "Revision of Hawaiian Cibotium" to the American Fern Society sessions of the American Institute of Biological Sciences meetings at Oregon State University. In 1954 Robert T. Clausen revised the Ophioglossaceae of the islands and included some major departures from his earlier treatments. Robert F. Blasdell (1956) made a detailed analysis of the differences between the two local species of Doodia, including the plant described by Otto Degener as D. lyonii. The published works of the present author include a monograph of the endemic genus Diellia and related articles (1950a, 1951, 1952, 1953a, 1953b), a revision of the peculiar plant known as Schizostege lidgatii (1949), and an analysis of the ferns naturalized in Hawaii (1950b). More recently, in connection with a National Science Foundation project, a biosystematic study has been initiated (1961, 1963) which promises to be very rewarding.

Attention should be called to some of the "trouble spots" in the biology of the local species, and the following are illustrative. In the genus of whiskferns, Psilotum (which includes two traditional species -- P. nudum, "moa" and P. complanatum, "pipi"), we recently found a number of apparent hybrids in a locality on Oahu (Wagner, 1962). A central question involving these intermediate plants is why, if the spores are truly

sterile as they appear to be, are there a number of specimens scattered at different spots. One theory to explain their apparent dispersal is that the hybrids are reproducing by the so-called "brood bodies," microscopic structures formed along the rhizomes that can be carried away by wind or water. In the lycopods, it is clear that we have some serious questions involved in the variations of the Lycopodium dentatum group. In other parts of the United States, we have recognized that variations of the related L. selago run the gamut from lax specimens of shaded sites in forests to the compact individuals of exposed rocky places. Will the Hawaiian plant known as L. haleakalae prove to be merely the end of an ecological series involving the variations of L. dentatum?

Many botanists have noticed that Hawaiian pteriodophytes tend as a whole to average smaller and more leathery than those of other Pacific areas. This tendency toward compact, thick-textured plants is found in the local representatives of many wide ranging species. It shows especially in Psilotum spp., Ophioglossum spp., Dicranopteris linearis, Nephrolepis exaltata, N. cordifolia, and Vittaria rigida. The plants are smaller and more coriaceous as a rule than the same species or nearly related species from southward and westward in Polynesia and Melanesia. I suspect that climatic conditions in Hawaii are responsible for this average tendency toward dwarfing and that some of the presumed endemics are nothing more than ecological variants or environmental modifications.

There are probably more individual "trouble spots" among the aspidioid ferns of Hawaii than in any other family of local ferns. For example, much to our surprise we discovered that there are really three different species of holly-ferns, Polystichum, at the top of Mauna Haleakala in Maui, not two. The inter-relationships of these species greatly need investigation. The situation becomes extremely complicated in Hawaiian Dryopteris, and there is little doubt that hybridization underlies many of the difficulties. The two complexes that promise especially interesting biosystematic results are the apogamous group of Dryopteris hawaiiensis--fusco-atra--paleacea, and the sexual group of D. acutidens--glabra--unidentata.

Some of our taxonomic problems are due merely to lack of critical collections. For example, in 1961 we were able to find a practically unbroken series of variations from the taxon known as Ctenitis latifrons to the one named C. honolulensis. Within one and the same species, evidently, there is variation from fully indusiate to partially indusiate to exindusiate sori. We now need to know whether a similar situation prevails in other Hawaiian ferns, i.e., whether two or more recognized taxa are not merely parts of one highly variable population. In the gleicheniaceous Dicranopteris linearis vs. emarginata, there is already some evidence that this is the case. I strongly suspect too that the blechnaceous Sadleria unisora is but an extreme condition of S. squarrosa. I had believed during the earlier stages of my work on Hawaiian ferns that Amphoradenium haalilioanum was a species different from A. oahuense; but it has become clear that the latter is the form that grows in lower, mesophytic woods, the former in higher, wet rain forest, and that, instead of two species here, we have only one with extremes of variation. It was necessary to find and assemble pertinent field collections to determine this.

On the other hand, some assemblages usually lumped under one species are probably going to have to be divided. Collections in 1961 indicate strongly that there are really three distinct elements in the genus Microlepia in Hawaii -- the two traditional species, M. speluncae and M. strigosa, plus a plant which seems more or less intermediate between them. The intermediate is very common in certain localities. There are very good indications now (Wagner, 1961) that there are two well marked species included in most herbaria under the name of Pteris irregularis, one of them the plant described by E. B. Copeland as P. hillebrandii, which has been ignored by most taxonomists as a mere variation of P. irregularis. Thanks to Dr. E. G. Bobrov of the Academy of Sciences, U.S.S.R., I have been able to examine the type specimen of P. irregularis and confirm its identity. I have separated out and identified all of the specimens of this group

in the B. P. Bishop Museum, so that they are now available for comparison. In the populations usually identified as Asplenium unilaterale it also appears that there are two distinct elements (Wagner, 1963).

Included among plants variously named "Dryopteris," "Cyclosorus," and "Thelypteris" sandwicensis, there are at least several species (including the one recently discussed by Iwatsuki, 1961). Part of the problem in this group has to do with the quality of available specimens. Unfortunately collectors usually take a mere fragment of a frond, or if they take a whole frond they bend and fold it into such a mess that it is nearly hopeless to study. Our policy at the University of Michigan is now, in the case of large fronds, to cut them up carefully into pieces each of which fits nicely on a herbarium sheet, and then use as many herbarium sheets as necessary to show exactly how large a specimen is and to show its different parts, basal, medial, and apical. Not until collectors attempt to make truly representative specimens of these thelypteroid ferns will we be in a position to evaluate them properly.

Once we have established a sound interpretation of the local Hawaiian pteridophytes by making careful studies of specimens, populations, chromosomes, and detailed morphology, we still have remaining the problem of their taxonomic relationships with the ferns of other parts of the world. Probably at least some of the Hawaiian "endemics" are little more than local races or subspecies of species known elsewhere. The following illustrate some of the outstanding comparisons that need to be made:

HAWAII	ELSEWHERE
Lycopodium polytrichoides	L. verticillatum
L. venustulum	L. clavatum
Selaginella deflexa	S. selaginoides
Ophioglossum concinnum	O. pedunculosum
Marattia douglasii	M. alata
Hymenophyllum recurvum	H. polyanthos
Vandenboschia davallioides	V. radicans
Cystopteris douglasii	C. fragillis
Polystichum haleakalense	P. dudleyi
Elaphoglossum aemulum	E. conforme
Tectaria gaudichaudii	T. cicutaria
Asplenium densum	A. trichomanes
Xiphopteris saffordii	X. serrulata
Vittaria elongata	V. rigida
Marsilea vestita	M. villosa

Taxonomists have attached a certain "glamor" to the fact that certain ferns are isolated in the Hawaiian islands so far away from their nearest relatives, so that even minor differences are exaggerated and local representatives are likely to be treated as species on the most minute character differences. It is necessary to avoid missing relationships of Hawaiian ferns that would be obscured by treating them as separate species when they are actually varieties or essentially the same as extra-Hawaiian species.

Roughly twenty of the Hawaiian endemics truly do depart radically from their relatives in the remainder of the world. Pteris lidgatii is one of these. This is an extremely rare and local plant that grows in certain steep mountain valleys in regions of very high rainfall. It is my hope that this peculiar plant will survive for future generations of botanists to appreciate and study. The poorly understood Dryopteris (Thelypteris) keraudreniana and D. rubiformis are unusual plants, unique among thelypteroid ferns, for their remarkable "sprawling" leaf habit in which the fronds -- which grow to reach at least five meters in length -- tend to lean or depend on surrounding vegetation. Athyrium macraei is another species of a large genus which is morphologically a sharp departure -- the sori in this species may occur on projections extending beyond the margins so that they are totally unlike any other known species in a genus

of some 600 species. F. O. Bower considered this plant to represent a distinct genus, Deparia. However, my collections from 1947, 1949, and 1961 show every conceivable intergradation from typical athyrioid sori to the extreme condition of "Deparia."

The endemic genus Sadleria is one of the prizes of the local flora, forming spectacular plants of various shapes and sizes. There are at least five species and perhaps several local subspecies that warrant recognition. Most of the sadlerias differ from Blechnum in their bipinnate leaves and their tree habit, but within Sadleria there is at least one species which is non-arborescent (S. squarrosa). As a single species, Microsorium spectrum, is an endemic of unusual beauty, unique among polypodioid ferns for having triangular or deltoid leaf structure. Among the variations of M. spectrum, especially on the island of Kauai, there are forms that possess deeply 3-5-lobed leaves that more closely resemble the presumed ancestral type.

A whole genus, Amphoradenium (syn. Adenophorus), of grammitid ferns is endemic in Hawaii. Characteristic golden-brown clavate glands on laminar surfaces and in the sori mark the genus, which contains at least eight species of extraordinary diversity. The fronds vary all the way from simple to decompound. If the genus is polyphyletic, as suggested by the diverse frond structure, the uniformity of the glands would seem to offer a startling case of convergent evolution. It seems more likely that this group of ferns is monophyletic, and that the diversity of leaf types resulted from local Hawaiian radiation from a plant like A. sarmentosum with narrow, lobed leaves. This fascinating assemblage of Hawaiian ferns sorely needs detailed analysis, and at this time we are not at all sure what the species limits are.

Another endemic genus, Diellia, with five species, contrasts sharply with its spleenwort relatives in other parts of the world in its short marginal sori. A notable plant collected long ago (1879, Makawao, Maui, by F. L. Clarke) and named Asplenium leucostegioides is a Diellia in every respect except its asplenium-like sori, and it surely represents the ancestral stock from which Diellia must have evolved. I hope that A. leucostegioides will be re-discovered in the near future. My confidence is bolstered by the fact that such plants as D. erecta f. alexandri, D. laciniata, and Pteris lidgatii -- Hawaiian ferns long thought to be extinct -- have turned up again in explorations of the past fifteen years. Perhaps, too, we shall re-discover the very rare endemic grapefern, Botrychium subbifoliatum. The spectacularly beautiful Diellia mannii should be sought in the dry canyons of western Kauai, where it has not been re-collected for well over a half-century.

Pteridologists must be prepared for surprises in the Hawaiian flora, for species from other parts of the tropics are now "seeping" into the local vegetation from gardens and becoming naturalized. Some of the commonest ferns in Hawaii today were unknown to collectors in the time of William Hillebrand during the latter half of the nineteenth century. Nearly twenty species have now escaped into the Hawaiian forest, including Adiantum cuneatum, Pteris vittata, Ceratopteris thalictroides, Pityrogramma calomelanos, Nephrolepis biserrata var. furcans, Blechnum occidentale, Thelypteris dentata, and Microsorium scolopendria -- all of these now well established and common members of the flora. I have now been observing the Hawaiian pteriodophyte flora long enough to be able to see the increase of one of the introductions, which I listed in 1950 as having been "introduced into the Hawaiian flora in very recent times" and being localized in the "Kohala Mountains in Hawaii." In 1961 I was greatly surprised to discover this plant now flourishing along the Castle and the Waikane-Schofield Trails in the Koolau Mountains of Oahu, where a dozen years before it was unknown. At the present time, Athyrium japonicum, the plant in question, is undergoing a rapid spread, and it will be interesting to watch its extension through the islands. I am not convinced that these "weedy" ferns which have become naturalized are necessarily a threat to the native species by which they are now growing side by side. It is possible that certain introduced flowering plants, especially Lantana and Eucalyptus, have reduced populations of some of the rarer Hawaiian ferns, but now that the more serious of these pests, Lantana, is becoming less prevalent it seems likely that some of the native species will once again increase their area into places earlier blocked off by this naturalized shrub.

Perhaps these random notes will stimulate some interest in Hawaiian pteridophytes and indicate some of the directions into which research should go. For complete novices, I suggest the excellent publication by D. H. Hubbard (1952), "Ferns of Hawaii National Park," which is an accurate and extremely useful introduction to the ferns of Hawaii. Only about one-third of the Hawaiian pteridophytes are listed there, but most of the conspicuous and common types are represented. For the serious amateur, I suggest consultation with local botanists at the University of Hawaii and the B. P. Bishop Museum. On Maui, Mr. Edwin Bonsey of Makawao is rapidly becoming one of the authorities on the pteridophytes of that island. I shall, myself, be glad to identify any materials sent to me at the University of Michigan, and to provide any advice that is possible. In any event, it seems to be high time that there is some resumption of the once substantial local interest there used to be in the Hawaiian pteriodophytes. Anything that can foster that interest seem desirable; and perhaps the addition of a few members to the American Fern Society from Hawaii will be a step in the right direction.

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H O N O L U L U B O T A N I C G A R D E N S

Paul Weissich[1]/

On May 31, 1963 the City officially adopted the name of Honolulu Botanic Gardens. This name designates the various gardens within the present system: Foster Botanic Garden, Wahiawa Botanic Garden, Koko Crater Botanic Garden, and the Kapiolani Hibiscus Garden. This designation has already eliminated confusion and has helped to better crystallize the identity of the botanical gardens system and ultimate public function.

Ted Green, Gardens' Landscape Architect, spent two months in the South Pacific on a collecting trip. He also attended the Orchid Conference in Singapore. Materials collected include plants from the wilds of the New Hebrides, Guadalcanal, the backwoods of the northeast coast of Australia, and New Guinea.

Director Paul Weissich travelled as the guest of C. M. Willis, Trustee, Friends of Foster Garden to the Cactus and Succulent Society of America's annual convention in San Diego. Plans and activities of the Koko Crater Garden were presented, and contacts were made with a number of plant collectors. Collections were made in Baja California, the Tucson desert area, and the Anza-Borrego Desert for the Koko Crater Garden.

Peter Green, Arnold Arboretum taxonomist, spent two days in Honolulu. Green, formerly with the Royal Botanic Garden in Edinburgh, is on the trail of the Oleaceae, the genus Jasminum in particular. He has sent new Fijian plants for the Honolulu collection and indicates that other things will be sent as he continues his travels through the South Pacific.

A project begun many years ago by Dr. H. L. Lyon, Colin Potter, and Dr. J. F. Rock is continuing at an accelerated pace. The projects consists of the collecting and growing of all the extant Hawaiian Pritchardia (loulu, Hawaii's only native palms). Ultimately, after the present studies have been completed, a revision of the genus will be published. Field work is being done by volunteer John Obata, Kawananakoa Intermediate School biology teacher. He is systematically mapping the Oahu Pritchardia, recording location and population. When possible, he is also collecting seeds and/or young plants. Many of these are being established at Foster Garden. A new partner in this venture by Earl T. Ozaki, Plant Quarantine Inspector (USDA), who is also bringing in native plant material for the Hawaiian plantings at the Wahiawa Garden.

Many construction projects are in progress at the present time. At Foster Garden the $13,000 propagation and storage house was completed in early September. The $45,000 entrance and parking area is almost complete. The opening of the new entrance from the Vineyard Thoroughfare at Nuuanu Stream is planned for January 1964, after basic planting and sprinklers have been installed. The first step in plans to bring the Liliuokalani Garden (now part of Foster Garden) into public botanic use has been made. Construction work has begun on rest room facilities there.

At Kapiolani Garden, several new endemic Hibiscus have been added to the unique collection. This was made possible by Drs. Otto & Isa Degener, John Obata, and Mrs. John Rhys. A re-opening is planned in the near future.

Many plantings have been made all during the year at Koko Crater. Many of the rare specimens from the University of California collection are being readied for planting when the fall rains begin. This project is under the direction of volunteer C. M.

1/ Director, Honolulu Botanic Gardens

Wills. Several hundred hybrid Aloe are being planted. They will be evaluated for superior qualities of flower size, shape, color, and "lastability". It is hoped that they will provide a new, easily grown, drought resistant cut flower and garden ornamental.

The Wahiawa Garden staff has been preparing the Anthurium planting area. A slope adjacent to the nursery has been cleared, with a path constructed and sprinklers installed. A foot of mulch is being incorporated into the slope prior to planting.

The Gardens will be one of the major recipients of materials from the University of California's Seventh Expedition to the Andes led by Paul Hutchison. He was here last year to consult on the Koko Crater project and spoke at the December 1962 Botanical Society meeting. Since that time he has organized and acquired financing for a year and a half field trip to the east face of the Andes, the headwaters of the Amazon. Many of the areas are unexplored. Through generous financial assistance from the Friends of Foster Garden, the Honolulu Botanic Gardens is one of the receiving institutions and has been selected as the primary repository for tropical accessions. Funds resulting from the plant sales of the Friends of Foster Garden were used to invest in this field research.

I N M E M O R I A M

RALPH S. HOSMER, 1874-1963: Professor Ralph S. Hosmer, pioneer forester in Hawaii, died at his Ithaca, New York home on July 19. He was born in Deerfield, Mass. on March 4, 1874, and received his B.A.S. from Harvard in 1895 and M.F. from Yale in 1902.

He was an assistant in the Division of Soils, USDA from 1896-98, and with the U.S. Forest Service from 1898-1914, first as field assistant (1898-1902), then as Chief, Section of Forest Replacement (1902-03), and Collaborator (1903-1914).

As Territorial Forester from 1904 to 1914, he was head of the Forestry Division in Hawaii. During this period J. F. Rock joined his division. Hosmer was also during his residence in Hawaii a member of the Board of Regents, College of Hawaii (1907-14) and Chairman, Conservation Committee of Hawaii (1908-14). He organized the Harvard Club of Hawaii and was its secretary from 1907-14. Many of the present forest reserve boundaries in Hawaii were planned under his supervision.

He left Hawaii in 1914 and was Professor of Forestry and Department Head at Cornell University until 1942, when he became Professor Emeritus. He was a member of the Northeastern Forest Reserve Council (1924-42) and State Conservation Advisory Council, New York (1931-40). Hosmer was secretary of the Forestry Section of the International Congress of Plant Sciences in 1926 and a fellow of the Forest History Foundation. The Society of American Foresters awarded him the Sir William Schlich Medal in 1950 for "eminent service to forestry." He was a fellow of the Society and first treasurer in 1900-03 and president in 1923. He joined the Hawaiian Botanical Society this year. (AKC)

AGNES CHASE, 1869-1963: The grass specialist, Mrs. Agnes Chase, died on September 24 after a short illness. She was born in Iroquois County, Illinois, on April 20, 1869 and was educated in Chicago. In 1901-03 she was an assistant in botany at the Field Museum of Natural History (now Chicago Natural History Museum). In 1903 she joined the U.S. Department of Agriculture, retiring as Senior Botanist in 1939. That same year she was appointed Research Associate in the National Herbarium, Smithsonian Institution.

In 1956 she was selected as one of the 50 botanists to receive a certificate of merit at the 50th anniversary meeting of the Botanical Society of America. At the age of 89 she received an honorary Doctor of Science degree from the University of Illinois. Her contributions in the field of grasses were numerous, with many revisions and manuals. (AKC)

B O T A N I C A L N O T E S

HAWAIIAN SUGAR PLANTERS' ASSOCIATION: Robin Campbell of Natal and Pierre Andrés of Swaziland spent a week in July with HSPA scientists touring the sugar industry here. Both men manage extensive sugar plantations in South Africa. Their visit to Hawaii followed similar visits to Israel, England, Peru, and the Mainland. (LGN/HOW)

A five man team of Okinawa sugar and government leaders visited HSPA for two weeks. Their visit was a follow-up of a survey conducted in Okinawa by a six-man team of USDA and HSPA scientists, at the request of the U.S. Army. The visitors included Shoei Yamashiro, Chief, Kunigami Federation of Motobu; Mutsuo Nakada, President, Hokubu Sugar Co.; Honshu Tishimoto, Managing Director, Hokubu Sugar Co.; and Morihisa Nakayama, Chairman, Nago Municipal Assembly. (Hawaii Sugar News)

HAWAIIAN ACADEMY OF SCIENCE: The fall sessions of the Academy will meet on Monday and Tuesday evenings, November 25-26, at 7:30 p.m. in Agee Hall, HSPA Experiment Station. A symposium, tentatively entitled "Population Management, Man's No. 2 Problem", will be held the first evening. Papers in the biological sciences will also be presented on Monday and those in the social and physical sciences on Tuesday.

The Inter-Society Science Education Council (ISSEC) coordinates the various science education activities of the Academy. This year's chairman is Dr. Donald P. Gowing, Assistant Director, PRI. Dr. John H. Payne, HSPA, is the Chairman of the Community Participation Committee. People, time, and money (Treasurer: Dwight H. Lowrey, c/o Cooke Trust Co., Honolulu) are needed to make these different projects successful.

LAND USE COMMISSION: The Land Use Commission, State of Hawaii, has been appointed by Governor John A. Burns. These are: Leslie E. L. Wung, Manager, E. L. Wung Ranch, Hawaii; Goro Inaba, Manager, Kona Hotel, Hawaii; Charles S. Ota, real estate and insurance salesman, Maui; Robert G. Wenkam, photographer, Honolulu; C. E. S. Burns, Jr., Manager, Oahu Sugar Co.; Shiro Nishimura, poultry farmer, Kauai; and Myron B. Thompson, Executive Director, Liliuokalani Trust, Oahu. James P. Ferry, Kailua (Oahu) realtor, has been named Director of the Department of Land and Natural Resources.

One of the Commission's first tasks is to establish the land use boundaries for the districts (agriculture, rural, urban, and conservation) permanent. The deadline for this is July 1, 1964.

In announcing the appointees, Governor Burns said: "It should be made clear that careful consideration was given to the selection ....because of the weight their decisions will have on the orderly development of our State. It is vitally important that the land use law be interpreted by thoughtful persons to assure its proper implementation so that Hawaii's natural scenic beauty and open spaces will be safeguarded in the best interest of our citizens, both present and future."

EAST-WEST CENTER: Three of the South Pacific Commission's executive officers have been appointed as consultants to the East-West Center to plan an extended co-operative training program in the South Pacific area. They are: Jacques Barrau, Economic Development; Richard Seddon, Social Development; and Guy Loison, Health.

PACIFIC SCIENCE ASSOCIATION: Professor Victor Stochava, Institut Botanique, Leningrad, USSR, has been appointed to the Standing Committee on Pacific Botany by Dr. F. R. Fosberg.

SOUTH PACIFIC EXPEDITION: Dr. Sherwin Carlquist spent 14 months and travelled 30,000 miles on an expedition in the South Pacific, including the Society Islands and New Guinea. He is Associate Professor of Botany at Claremont Graduate School and University Center, and anatomist and morphologist at the Rancho Santa Ana Botanic Garden.

During his trip he discovered two new species of Scaevola and Fichtia. His collection of 850 specimens include not only dried specimens, but pickled ones as well. He will make a comprehensive study of the Scaevola collected. In New Guinea he accompanied groups from the Australian Mapping Service and the British Museum.

He also plans to write a book on natural history, based upon his trip and research. It will discuss certain peculiarities common to flora and fauna on islands isolated from large land masses.

His expedition was financed by a National Science Foundation Grant.

(Claremont Colleges)

VISITOR: Dr. Benjamin C. Stone of the Biology Department, College of Guam, visited the B. P. Bishop Museum and the University of Hawaii for several weeks during late summer. (HOW/AKC)

NATIONAL BIOLOGICAL INSTITUTE, BOGOR: The National Biological Institute at Bogor, Indonesia, consists of several related elements. These include the Botanical Gardens, Herbarium Bogoriense, Museum Zoologicum Bogoriense, Institute for Botanical Research, and the Institute for Research on Marine Biology. A list of the principal personnel appeared in the May issue of the Newsletter (II(5):66-67). In order to arrange the related elements to provide convenient and efficient use by scientists and the Indonesian public, a master plan for site development is being considered by the Council for Sciences of Indonesia.

Harland Bartholomew and Associates and Lublin, McGaughy & Associates have both proposed to work on this project. The master plan will provide for the long-range goals, departmental needs, relationship of uses, planned expenditures, program for development of uses, planned expenditures, program for development of facilities, and construction program. Extensive analyses will be prepared after intensive research, site examination, and definition of the problems involved. (MSD/AKC)

KEWALO OCEANOGRAPHIC RESEARCH CENTER: A proposal has been made to utilize the entire triangular land area on the southeastern side of Kewalo Basin for an oceanographic research center. The agencies to use these facilities will be the University of Hawaii, U. S. Bureau of Commercial Fisheries (USBCF), and the State of Hawaii Division of Fish and Game. The latter two agencies presently occupy this site. The plans for the proposed center have been made by Lublin, McGaughy & Associates.

The center will enable the USBCF to expand its present dockside area for oceanographic research ships and provide shoreside research facilities using large amounts of sea water. It will provide a similar facility for the University's Institute of Geophysics and a laboratory for experimental marine organisms for the Biomedical Research Center.

The site is considered to be ideally situated since it provides an isolated work area close to the open sea and to the University campus. The basin offers a protected harbor close to outfitting, repair, and supply centers. (MSD/AKC)

D. E. YEN: Dr. Douglas E. Yen, sweet potato specialist from New Zealand, will be in Honolulu November 13-16. He will be in consultation with the B. P. Bishop Museum and is en route to the Juan Fernandez Islands in conjunction with his sweet potato research. He will return to New Zealand via Hawaii in January. (Brenda Bishop/AKC)

CONFERENCE: The Humid Tropics Committee of UNESCO will meet in Dandung, Java on December 2-6. (MSD)

AFRICAN TRIP: The Scott Pratts and the Dudley Pratts traveled to Africa and are visiting botanical gardens and points of interest on their trip. (CHL)

PRI DIRECTOR: Dr. Sterling Wortman, Assistant Director of the International Rice Research Institute, has been appointed Director of the Pineapple Research Institute of Hawaii. He will succeed R. Cushing, who becomes Director of Research of the Hawaiian Sugar Planters' Association upon Dr. L. D. Baver's retirement in December. Wortman is expected to arrive in Honolulu next year.

U N I V E R S I T Y O F H A W A I I

PLANT SCIENCE BUILDING PROJECT: The "Budget Report for the Plant Science Building, University of Hawaii," (80 pp.) was completed in August by Lublin, McGaughy & Associates. It is hoped that funds for the architectural work will be requested in the coming State Capital Budget. This would be on a contingency basis, since it appears that outside funds for half of these costs will be available. (AKC)

DEPARTMENT OF HORTICULTURE: New staff members include Dr. Richard Hartmann and Dr. Donald P. Watson. Hartmann is a specialist in vegetable crops and comes to Hawaii from the University of California at Davis. Watson is from Michigan State University and his field is floriculture.

Dr. Henry Nakasone, Assistant Horticulturist, returned from Okinawa. He worked there with the Michigan State University advisory group in floriculture and fruit growing.

Dr. James Brewbaker, Associate Horticulturist, led one of the symposia of the Eleventh International Congress of Genetics in the Netherlands. He also visited the Brookhaven National Laboratory to conduct research with nuclear reactors. (HFC/HOW)

DEPARTMENT OF SCIENCE: Dr. Albert J. Bernatowicz, Professor, is now lecturing Science 120 in two sections at the Varsity Theater because of the large class size. He spent the past summer working on algae from Bermuda in preparation for distribution of the herbarium specimens.

Vera Lim from Hong Kong has been appointed a graduate assistant. Her field is plant taxonomy. (AJB/HOW)

DEPARTMENT OF BOTANY: A team of American Scientists convened by Dr. Maxwell S. Doty was sent to Indonesia by the University of Hawaii. Dr. Sarwono Prawirohardjo, President of the Council for Sciences of Indonesia, requested that the group come to advise the Ministry of Research in the development of programs for botanical study in Indonesia and to promote closer scientific cooperation with the University. The team included Dr. George W. Gillett, Associate Professor of Botany, and Dr. Paul J. Scheuer, Professor of Chemistry, U. H.; Dr. Elmer Nussbaum, Senior Scientist, Oak Ridge Institute of Nuclear Studies; Dr. Sterling Wortman, Assistant Director, International Rice Research Institute; and Dr. A. C. Smith, Assistant Secretary, Smithsonian Institution. (MSD/HOW)

Dr. A. C. Smith, recently appointed Director of Research, is expected to arrive in Honolulu in late November. (AKC)

Dr. Maxwell S. Doty and Dr. William J. Gilbert visited Hawaii Volcanoes National Park during the summer to facilitate the development of a bioecological study of the park being planned by Doty. (MSD/HOW)

N E W P U B L I C A T I O N S*

DOTY, MAXWELL S. (editor). 1963. PROCEEDINGS OF THE CONFERENCE ON PRIMARY PRODUCTIVITY MEASUREMENT, MARINE AND FRESH WATER, held at University of Hawaii, August 21-September 6, 1961. ix + 237 pp., 27 figs., 36 tabs. TID-7633, Biology and Medicine, Division of Technical Information, U.S. Atomic Energy Commission. Available from the Office of Technical Services, Dept. of Commerce, Washington 25, D.C. ($3.00).

This publication is the result of a symposium sponsored jointly by the U.S. Atomic Energy Commission and the Division of Botany of the 10th Pacific Science Congress. This international activity involved the participation of representatives from Australia, Canada, England (Uganda), France (New Caledonia), Japan, New Zealand, USA, and USSR. The papers cover the development of the different aspects of primary productivity and give its current status up to August 1961, and serves as a source book on primary marine productivity measurement. Since fresh water productivity measurement utilizing radioisotopes is so similar, a paper on this was also included although it was not presented at the symposium. All the bibliographic materials were collected in one final chapter. To this was added a number of significant papers not cited in the individual papers.

*Compiled by Alvin K. Chock

Papers in this publication include: M. Angot, A summary of productivity measurement in the southwestern Pacific Ocean (pp. 1-9, 4 figs.); O. Koblentz-Mishke, A summary of productivity measurement in the north Pacific Ocean (pp. 10-17, 4 figs., 2 tabs.); R. Holmes, A summary of productivity measurement in the southeastern Pacific Ocean (pp. 18-57, 1 fig., 12 tabs.); M. B. Allen, Our knowledge of the organisms in Pacific phytoplankton (pp. 58-60); G. C. Anderson & K. Banse, Hydrography and phytoplankton production (pp. 61-90, 13 tabs.); Y. Saijo & S. Ichimura, A review of the recent development of techniques measuring primary production (pp. 91-96); L. R. Pomeroy, Isotopic and other techniques for measuring benthic primary production (pp. 97-102, 1 tab.); C. R. Goldman, The measurement of primary productivity and limiting factors in fresh water with Carbon-14 (pp. 103-113, 4 figs., 1 tab.); H. R. Jitts, The standardization and comparison of measurements of primary production by the Carbon-14 technique (pp. 114-120, 1 tab.); G. F. Humphrey, Phytoplankton pigments in the Pacific Ocean (pp. 121-141, 5 figs., 1 tab.); J. F. Talling & D. Driver, Some problems in the estimation of Chlorophyll-A in phytoplankton (pp. 142-146, 2 tabs.); W. H. Thomas, Physiological factors affecting the interpretation of phytoplankton production measurements (pp. 147-162, 6 figs., 3 tabs.); R. M. Cassie, Statistical and sampling problems in primary production (pp. 163-171, 3 figs.); J.D.H. Strickland, Significance of the values obtained by primary production measurements (pp. 172-183); Maxwell S. Doty, A bibliography of articles pertinent to primary productivity (pp. 184-212), and Directory of participants in the series of symposia on uranium productivity in the Pacific (pp. 213-237).

LI, HUI-LIN. 1963. WOODY FLORA OF TAIWAN. 974 pp., 370 illus. (by C. T. Chen). Livingston Publishing Co., Narberth, Pa. ($18.75). Morris Arboretum publication. This attractive flora contains descriptions of more than 1,000 species of woody flowering plants found on the large island off Taiwan (Formosa) off the coast of mainland China. Keys, descriptions, and notes make this a complete, concise, comprehensive, and up-to-date flora, based on a careful study by a skillful botanist of many collections in herbaria in Europe and America, as well as the Orient. A number of the species are widespread in and around the Pacific, and many of those found chiefly in Taiwan belong to genera with wide distribution. The author is a botanist with the Morris Arboretum and Division of Biology of the University of Pennsylvania. (E.H. Bryan, Jr. in PSA Info. Bul. 15(4):11)

MOORE, JOHN WILLIAM. 1963. NOTES ON RAIATEAN FLOWERING PLANTS with Descriptions of New Species and Varieties. B. P. Bishop Museum Bul. 226:1-36, figs. 1-24. A few plants collected by Moore in the 1920s were not described because they were without flower or fruit. H. St. John collected additional specimens of these plants from locality data supplied by Moore while a member of the Mangarevan Expedition (1934). New taxa described include: Garnotia St.-Johnii, Mariscus raiateensis, Glochidion longipedicellatum, G. myrtifolium, G. salicifolium, G. temehaniense, Macaranga venosa, Crossostylis raiateensis, Metrosideros collina var. fruiticosa, and var. temehaniensis, Meryta raiateensis, Rapanea raiateensis, and Psychotria cookei. He also includes a new combination, Fagara Nadeaudi (Drake) Moore, and cites Leucaena insularum (Guillemin) Daniker. The types have been deposited at the Bishop Museum.

VAN STEENIS, C.G.G.J. (editor). 1963. PACIFIC PLANT AREAS, vol. 1. (Van Steenis-Kruseman, M. J. Bibliography of Pacific and Malaysian Plant Maps of Phanerogams). 297 pp., 26 plant area maps. Monographs of the National Institute of Science and Technology, Monograph 8, Vol. 1. Manila, P. I.
Pacific Plant Areas was first suggested by Prof. Dr. H. J. Lam during the 6th Pacific Science Congress in 1939. Progress on the project was reported at the 7th Congress in 1949. A further report consisting of an enumeration of the collections made in the Pacific was made by Prof. Dr. W.R.B. Oliver, then chairman of the Committee at the 8th Congress in 1953. At that time the standing committee was merged into a broader committee, with Dr. F. R. Fosberg as chairman, and Dr. Van Steenis became chairman of the subcommittee on Pacific plant areas when Dr. Lam relinquished it in 1958.

The volume contains a bibliographic list of all maps printed in the past, by family and genus. It is an index to published maps showing distribution of Pacific and Malaysian phanerogams. The name of each taxon is followed by the literature citation. In addition, 26 distribution maps of Pacific plants (Dolichandrone spathacea, Rhizophora mucronata,

R. apiculata, R. stylosa, R. mangle, R. lamarckii, R. harrisonii, Bruguiera gymnorrhiza, B. parviflora, Ceriops tagal, Triumfetta procumbens, T. repens, T. grandidens, Campnosperma brevipetiolatum, Mapania macrocephala, Dichapetalum, Rourea subg. Palliatus sect. Palliatus, Canarium, Gonystylus, Gynotroches, Styrax agrestis, Tecomanthe, Crossostylis, Crateva religiosa, Sanicula, and Oreomyrrhis. The maps and habitat data were compiled by C.G.G.J. Van Steenis, Ding Hou, J. H. Kern, P. W. Leenhouts, and M. Jacobs. The editor hopes to issue similar volumes with plant map distributions on an annual basis.

H A W A I I A N B O T A N I C A L S O C I E T Y M E E T I N G

TIME: Monday, November 4, 1963 - 7:30 p.m.
PLACE: Agee Hall, Experiment Station of the Hawaiian Sugar Planters' Association, 1527 Keeaumoku Street, Honolulu.
SUBJECT: "Plants are for People."
SPEAKER: Dr. Donald P. Watson, Visiting Professor of Horticulture, University of Hawaii. He is Head of the Division of Ornamental Horticulture at Michigan State University and one of the foremost horticultural educators. His experience with horticulture began during his youth, for he lived on a fruit farm in Canada. He was educated at the Ontario Agricultural College, University of Toronto, University of London, and the Royal Botanic Garden at Kew. He received his Ph.D. from Cornell University. He taught for five years at the Long Island Institute of New York. As a fellow of the U.S. War Department he did research at the tropical botanical garden of Harvard University in Cuba. He has published 80 papers in horticulture and has done much work in horticultural education through television. He has produced a series "Plants are for People," which is viewed on a southern Michigan network as well as through NBC in New York. He has written a book "Therapy through Horticulture." Watson is past editor of the Michigan State Nursery Notes and the American Horticultural Council News. He is vice-president of the Michigan Horticulture Society, Director of the American Horticultural Society, as well as representative from the American Society of Horticultural Science. He recently visited 24 countries on a six months trip as Chairman of the Committee for Education for the American Horticultural Society.

ANNUAL MEETING: The Society's annual meeting will be held on Monday, December 2, at 7:30 p.m. at Agee Hall. It will include the election of the officers for 1964, and the annual reports. Dr. Maxwell S. Doty, Society President, will be the speaker.

O R G A N I Z A T I O N A L N O T E S

At the September meeting the following were elected members of the Society: George Johannessen, Pineapple Research Institute; S. C. Christian, Dole Corporation; D. Mueller-Dombois and Dennis C. Greathouse, Dept. Botany, Univ. Hawaii; T. G. Yuncker, Prof. Emeritus of Botany, DePauw Univ.; Sherwin Carlquist, Rancho Santa Ana Botanic Garden; George C. Ruhle, National Park Service, Washington, D. C.; Mrs. Helen Baldwin, Hilo; C. M. Rick, Professor of Vegetable Crops, Univ. of California at Davis; Eugene H. Davidson, Plant Quarantine Division, ARS, USDA; S. G. Stephens, Professor of Genetics, North Carolina State College; and Peter J. R. Hill, Truk, Caroline Islands.

A committee to study all aspects of the Newsletter and to recommend to the Society terms for its continuation or discontinuation was appointed by the President. At the present time the Committee consists of Alvin K. Chock (chairman), W. M. Bush, and Donald P. Gowing.

Toshio Murashige submitted a letter of resignation as secretary because of an impending move, and the necessity to complete his present research work. His resignation was accepted with regret and a new secretary will be elected at the November meeting. The President appointed E. J. Anderson as auditor, and C. H. Lamoureux chairman of the nominating committee.

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The HAWAIIAN BOTANICAL SOCIETY was founded in 1924 to "advance the science of Botany in all its applications, encourage research in Botany in all its phases," and "promote the welfare of its members and to develop the spirit of good fellowship and cooperation among them." "Any person interested in the plant life of the Hawaiian Islands is eligible for membership in this Society."

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The Hawaiian Botanical Society Newsletter is published monthly, except during the summer months of July, August, and September. It is distributed to all Society members and other interested individuals and institutions, with the purpose of informing them about botanical news and progress in Hawaii and the Pacific. News contributions and articles are welcomed. The deadline for submission of news items is the 20th of each month prior to publication.

Duplicated at the Pineapple Research Institute of Hawaii.

Membership Dues are $2.00 per calender year and include receipt of the Newsletter.

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c/o Department of Botany
University of Hawaii
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